Design circular economy bioprocesses for winemaking waste conversion into biostimulants: Functional evaluation

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Introduction

Derived from wine industries, approximately seven million tons of grape pomace and lees are originated annually worldwide

Lees are high added-value by-products due to its wide variety of compounds. The wine lees are a combination of yeasts, organic acids, insoluble carbohydrates, inorganic salts, lignin, proteins, phenolic compounds, and ethanol. These compounds are susceptible of extraction or transformation and exploitation with the consequent economic benefit.
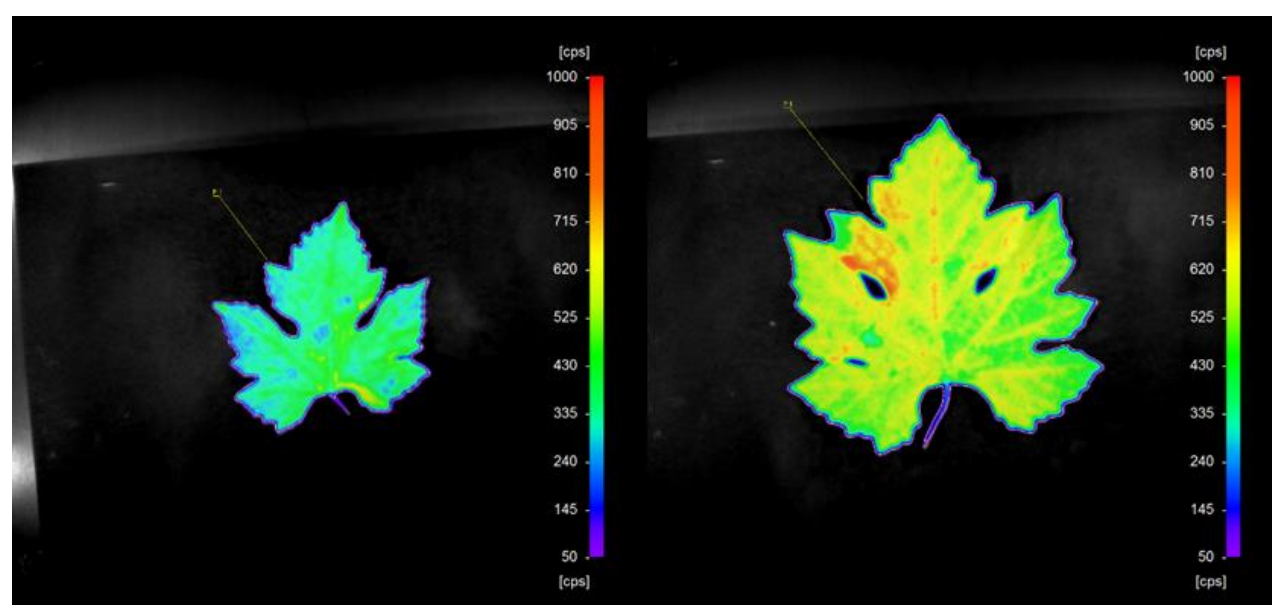
Results & Discussion
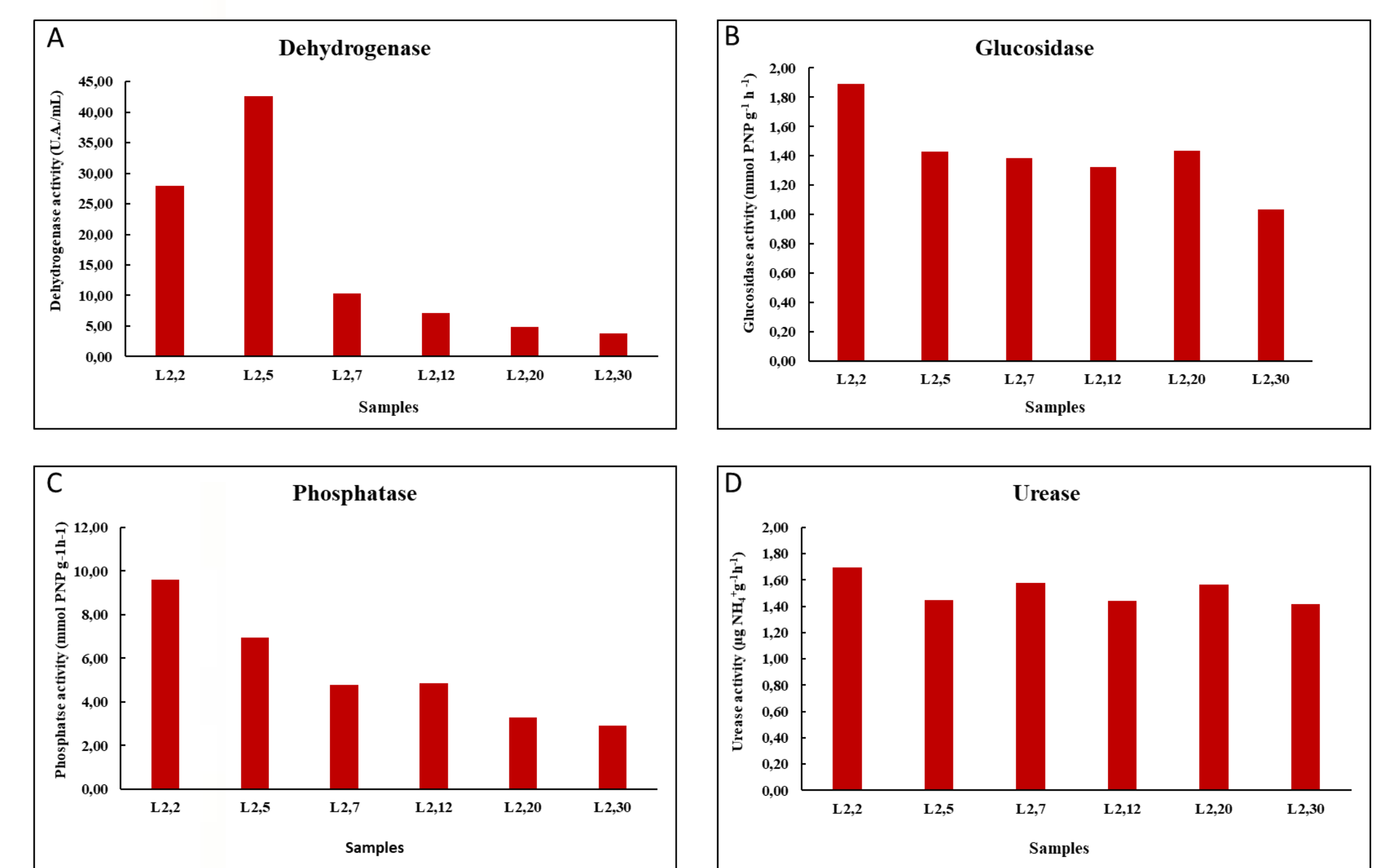
Biostimulant production

Enzymatic hydrolysis
- **Subtilisin**
- **Monitored parameters**
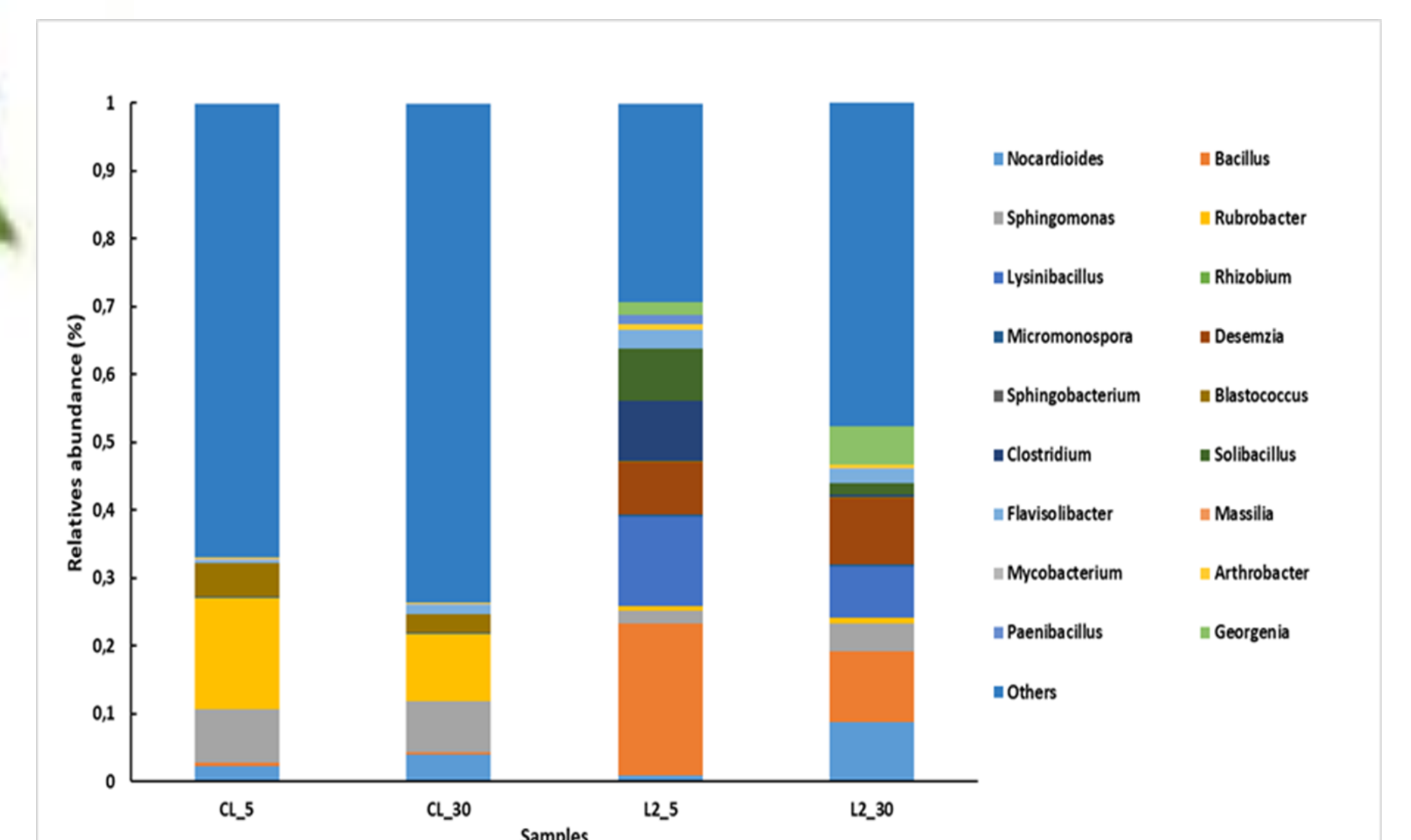 - pH
  - temperature

Biostimulation in plants

	Net photosynthetic rate		ETR		PhiPS2		Fv'/Fm'		Fluorescense	
	MEDIA	SD	MEDIA	SD	MEDIA	SD	MEDIA	SD	MEDIA	SD
BSs	9,00178	1,105024	27,68898	3,407564	0,131489	0,016182	0,914489	0,025827	44,99814	6,474643
Control	7,221032	0,5061	26,47586	3,004994	0,124123	0,038577	0,925686	0,016208	33,00665	2,56511

Functional categories assigned by COG ("Cluster of orthologous groups")

Cellular components
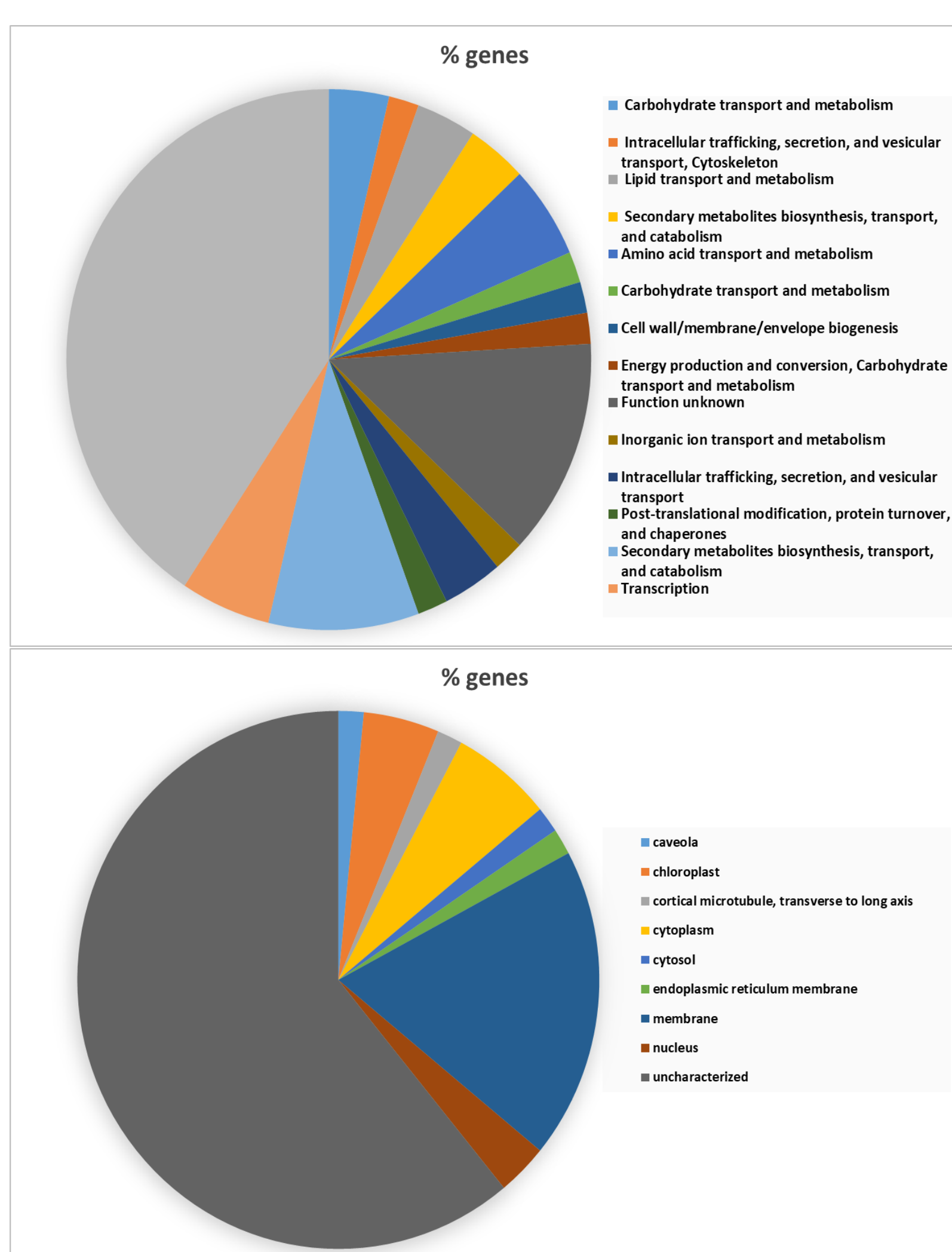
RNA-seq

Biostimulation in soil

Enzymatic activities

Metabarcoding
- psychrophilic and psychrotolerant phosphate-solubilizing bacteria (PSB)
- plant growth-promoting rhizobacteria (PGPR)

Conclusions

A new circular economy process has been developed to convert winemaking residues into new agronomic biostimulants, and its potency has been verified in plants through its capacity to induce the photosynthetic system and in soils through the enzymatic activities and bacterial communities that form it.